

ORIGINAL RESEARCH

Efficacy of SSPF using longest possible screws in both pedicles of fractured vertebra

¹Dr. Pankaj Kumar, ²Dr. Ramnandan Suman, ³Dr. Asif Ahmad Khan

¹Assistant Professor, ²Professor and HOD, ³Senior Resident, Department of Orthopaedics, Vardhman Institute of Medical Sciences, Pawapuri, Nalanda, India

Corresponding Author

Dr. Pankaj Kumar

Assistant Professor, Department of Orthopaedics, Vardhman Institute of Medical Sciences, Pawapuri, Nalanda, India

Received: 10 September, 2022

Accepted: 14 October, 2022

ABSTRACT

Background: A burst fracture of the spine is a type of vertebral fracture where the vertebral body is severely compressed or shattered. The present study was conducted to assess efficacy of SSPF using longest possible screws in both pedicles of fractured vertebra. **Materials & Methods: Results:** Out of 46 patients, males were 30 and females were 16. The mean operation time was 164.2 minutes, mean blood loss was 520.4 ml, follow up duration was 21.6 minutes, age at the time of operation was 32.1 years. Age (years) at the time of operation was 32.1. Anterior vertebral height (AVH) loss (%) at injury was 40.6 and post injury was 7.3. Loss of mid-sagittal height (%) at injury was 33.2 and post injury was 12.8. Fracture level was T12 in 26, L1 in 14 and L2 in 6 cases. Frankle grade A was present in 6, B in 5, C in 16, D in 14 and E in 5 cases. The difference was significant ($P < 0.05$). **Conclusion:** We suggest SSPF, which uses the longest screws feasible in both of the fractured vertebrae's pedicles. Radiological adjustments are significant when bipedicular fixation is used.

Keywords: bipedicular fixation, vertebral height.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

INTRODUCTION

A burst fracture of the spine is a type of vertebral fracture where the vertebral body is severely compressed or shattered.¹This typically occurs due to significant trauma, such as a high-energy impact from a fall, motor vehicle accident, or sports injury. Burst fractures often result from axial loading forces that exceed the spine's capacity to absorb the energy. This can cause the vertebral body to collapse in a way that fragments into multiple pieces.²They most commonly occur in the thoracic (mid-back) and lumbar (lower back) regions of the spine due to their weight-bearing nature. Symptoms can vary depending on the severity and location of the fracture but may include severe back pain, neurological deficits (such as numbness, weakness, or paralysis), difficulty walking, and loss of bowel or bladder control if the fracture affects the spinal cord.³

There is disagreement over the surgical approach that should be chosen as well. Reducing the number of vertebral levels involved in the fusion of a spine fracture is the primary goal of internal fixation.⁴Since its introduction, short segment pedicle screw fixation (SSPF) has been one of the most often used methods

for treating burst fractures of the thoracolumbar vertebrae because it allows for the incorporation of less motion segments during fixation. Numerous biomechanical investigations demonstrated that the application of pedicle screws could result in a stable structure during short-segment fixation.⁵Numerous variables contributed to the SSPF's failure; nevertheless, research indicates that the build becomes biomechanically stronger when screws are inserted at the fracture level. In many SSPF trials, short pedicle screws or unilateral screws have been utilized inconsistently to treat broken vertebrae.⁶The present study was conducted to assess efficacy of SSPF using longest possible screws in both pedicles of fractured vertebra.

MATERIALS & METHODS

The present study was conducted from June 2021 to December 2021 in Department Of Orthopaedics, Vardhman Institute Of Medical Sciences Pawapuri Nalanda on 46 patients with fractured vertebra of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. All underwent short segment pedicle screw fixation (SSPF). Preoperative and post-operative plain radiographs were evaluated for kyphotic angulations using the traditional Cobb method. Anterior Vertebral Height (AVH), Posterior Vertebral Height (PVH) were measured preoperatively and immediate

postoperatively. Average percentage loss of AVH and mid-sagittal height were calculated on preoperative and postoperative X-rays on follow up. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table: I Distribution of patients

| Total- 46 | | |
|-----------|------|--------|
| Gender | Male | Female |
| Number | 30 | 16 |

Table I shows that out of 46 patients, males were 30 and females were 16.

Table: II Assessment of parameters

| Parameters | Mean | SD |
|--|-------------|------|
| Mean operation time (minutes) | 164.2 | 5.6 |
| Mean blood loss (mL) | 520.4 | 45.2 |
| Follow up duration (months) | 21.6 | 2.3 |
| Age (years) at the time of operation | 32.1 | 4.5 |
| Anterior vertebral height (AVH) loss (%) | At injury | 40.6 |
| | Post injury | 7.3 |
| Loss of mid-sagittal height (%) | At injury | 33.2 |
| | Post injury | 12.8 |

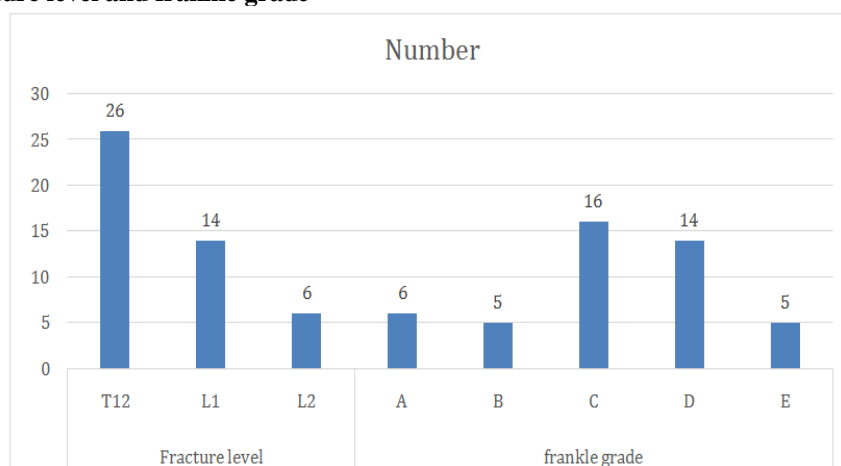
Table II shows that mean operation time was 164.2 minutes, mean blood loss was 520.4 ml, follow up duration was 21.6 minutes, age at the time of operation was 32.1 years. Anterior vertebral height (AVH) loss (%) at injury was 40.6 and post injury was 7.3. Loss of mid-sagittal height (%) at injury was 33.2 and post injury was 12.8.

Table: III Fracture level and frankle grade

| Parameters | Variable | Number | P value |
|----------------|----------|--------|---------|
| Fracture level | T12 | 26 | 0.02 |
| | L1 | 14 | |
| | L2 | 6 | |
| frankle grade | A | 6 | 0.05 |
| | B | 5 | |
| | C | 16 | |
| | D | 14 | |
| | E | 5 | |

Table III, graph I shows that fracture level was T12 in 26, L1 in 14 and L2 in 6 cases. Frankle grade A was present in 6, B in 5, C in 16, D in 14 and E in 5 cases. The difference was significant (P< 0.05).

Graph I: Fracture level and frankle grade



DISCUSSION

More than half of all thoracolumbar trauma cases are burst fractures, the most frequent kind of thoracolumbar spine fracture.⁷ Because inferior and/or superior endplates are frequently violated in burst fractures, the deformity may worsen over time as a result of the discs gradually settling into the fractured endplates and vertebral body.^{8,9} The present study was conducted to assess efficacy of SSPF using longest possible screws in both pedicles of fractured vertebra.

We found that out of 46 patients, males were 30 and females were 16. Padalkaret al¹¹ evaluated the efficacy of SSPF using longest possible screws in both pedicles of fractured vertebra. A retrospective chart review of 25 single burst thoracolumbar fracture patients, operated was conducted. Fourteen men and 11 women with an average age of 42.92 years comprised the study population. Mean age at the time of operation was 34.5±14.2 years. Mean operation time was 168±72 (minutes). Average hospitalization time was 9±7 (days). Mean blood loss was 515±485 (ml). There were two cases of postoperative infection and implant failure each. A mean of 15.2° of kyphosis correction was attained from pre-operation to post-operation (p<0.0001).

We found that mean operation time was 164.2 minutes, mean blood loss was 520.4 ml, follow up duration was 21.6 minutes, age at the time of operation was 32.1 years. Age (years) at the time of operation was 32.1. Anterior vertebral height (AVH) loss (%) at injury was 40.6 and post injury was 7.3. Loss of mid-sagittal height (%) at injury was 33.2 and post injury was 12.8. We found that fracture level was T12 in 26, L1 in 14 and L2 in 6 cases. Frankle grade A was present in 6, B in 5, C in 16, D in 14 and E in 5 cases. Alanayet al¹² evaluated the efficacy of transpedicular grafting in preventing failure of short-segment fixation for the treatment of thoracolumbar burst fractures. Twenty patients with thoracolumbar burst fractures were included in the study. The inclusion criterion was the presence of fractures through the T11-L3 vertebrae without neurologic compromise. The patients were randomized by a simple method into two groups. Group 1 patients were treated using short-segment instrumentation with transpedicular grafting (TPG) (n = 10), and Group 2 patients were treated by short-segment fixation alone (NTPG) (n = 10). Clinical (Likert's questionnaire) and radiologic (sagittal index, percentage of anterior body height compression, and local kyphosis) outcomes were analyzed. The two groups were similar in age, follow-up period, and severity of the deformity and fracture. The postoperative and follow-up sagittal index, percentage of anterior body height compression, and average correction loss in local kyphosis in both groups were not significantly different. The failure rate, defined as an increase of 10 degrees or more in local kyphosis and/or screw

breakage, was also not significantly different (TPG = 50%, NTPG = 40%, P = 0.99).

The shortcoming of the study is small sample size.

CONCLUSION

We suggest SSPF, which uses the longest screws feasible in both of the fractured vertebrae's pedicles. Radiological adjustments are significant when bipedicular fixation is used.

REFERENCES

1. Kothe R, Panjabi MM, Liu W. Multidirectional instability of the thoracic spine due to iatrogenic pedicle injuries during transpedicular fixation: a biomechanical investigation. *Spine*. 1997;22(16):1836-42.
2. Mahar A, Kim C, Wedemeyer M, Mitsunaga L, Odell T, Johnson B, Garfin S. Short-segment fixation of lumbar burst fractures using pedicle fixation at the level of the fracture. *Spine*. 2007;32(14):1503-07.
3. Guven O, Kocaoglu B, Bezer M, Aydin N, Nalbantoglu U. The use of screw at the fracture level in the treatment of thoracolumbar burst fractures. *Clinical Spine Surgery*. 2009;22(6):417-21.
4. Korovessis P, Repantis T, George P. Treatment of acute thoracolumbar burst fractures with kyphoplasty and short pedicle screw fixation: transpedicularintracorporeal grafting with calcium phosphate: a prospective study. *Indian Journal of Orthopaedics*. 2007;41(4):354.
5. Frankel HL, Hancock DO, Hyslop G, Melzak J, Michaelis LS, Ungar GH, et al. The value of postural reduction in the initial management of closed injuries of the spine with paraplegia and tetraplegia. *Spinal Cord*. 1969;7(3):179-92.
6. Cobb JR. Outline for the study of scoliosis. *Instr Course Lect*. 1948;5:261-75.
7. Farcy JP, Weidenbaum M, Glassman SD. Sagittal index in management of thoracolumbar burst fractures. *Spine*. 1990;15(9):958-65.
8. Patrick T, Russel CH, Christian AL, Dominique GP, Rene PL. Functional and radiologic outcome of thoracolumbar and burst fractures managed by closed orthopedic reduction and casting. *Spine*. 2003;28:2459-65.
9. Kramer DL, Rodgers WB, Mansfield FL. Transpedicular instrumentation and short-segment fusion of thoracolumbar fractures: a prospective study using a single instrumentation system. *Journal of Orthopaedic Trauma*. 1995;9(6):499-506.
10. Parker JW, Lane JR, Karaikovic EE, Gaines RW. Successful short-segment instrumentation and fusion for thoracolumbar spine fractures: a consecutive 4½-year series. *Spine*. 2000;25(9):1157-70.
11. Padalkar P, Mehta V. Bi-pedicle fixation of affected vertebra in thoracolumbar burst fracture. *Journal of Clinical and Diagnostic Research: JCDR*. 2017 Apr;11(4):RC04.
12. Alanay A, Acaroglu E, Yazici M, Ozgur A, Surat A. Short-segment pedicle instrumentation of thoracolumbar burst fractures: does transpedicularintracorporeal grafting prevent early failure? *Spine*. 2001;26(2):213-17.